

RESPONSE

Support

Applicants have amended claim 1 to require that the lubricating oil has a phosphorus content below 0.1% by weight, a sulfur content below 0.5% by weight, and a sulfated ash content below 1.5% by weight, as opposed to allowing for only one or more of these properties. Support for this amendment comes from claim 1 itself as well as from original claim 11 and page 17, lines 10-23 of the specification.

Applicants have also amended claim 1 to specify that the engine involved in the claimed method is a spark-ignited or compression-ignited engine having an exhaust treatment device. Support for this amendment comes from claim 11 and also on page 3, lines 23-26 of the specification.

Applicants have also amended claim 1 to specify that the engine of the claimed method is lubricated by a lubricating composition comprising an oil of lubricating viscosity and one or more lubricating oil additives. Support for this amendment comes from page 13, line 22 to page 14, line 6 of the specification.

Applicants have amendment claim 10 to specify that the method in the dependent claim is limited to a compression-ignited engine equipped with an exhaust gas recirculation system. Support for this amendment comes from claim 10 itself and also from page 3, lines 14-16 of the specification.

Claim 11 has been cancelled.

Applicants have amend claim 12 to make it consistent with amend claim 1, such that it now specifies that the fuel composition used in the method of claim 1 has a sulfur content below 80 ppm by weight. Support for this amendment comes from claim 12 itself as well as from page 3, lines 23-26 of the specification.

No other elements of the claims have been amended.

Response

The Examiner rejected claims 1, 3, 5, and 7-14 under 35 U.S.C. 103(a) as being unpatentable over Forde et al (US 6,136,051) in combination with Pudelski et al (US 6,412,468). Applicants respectfully disagree.

The Examiner stated that the exhaust treatment device previously specified by claim 11 and the requirement that the lubricating oil have at least one property selected from the group consisting of: a phosphorus content below 0.1% by weight, a sulfur content below 0.5% by weight, and a sulfated ash content below 1.5% by weight, among other features, set Applicants' invention apart from Forde. The

Examiner combines Forde with Pudelski to reach these features of Applicants' invention.

Applicants have amended claim 1 to require that the engine of the claimed method is a spark-ignited or a compression-ignited engine having an exhaust treatment device and that the oil used in the engine have a phosphorus content below 0.1% by weight, a sulfur content below 0.5% by weight, and a sulfated ash content below 1.5% by weight and is lubricated by a composition comprising an oil of lubricating viscosity. Applicants submit that Pudelski does not provide teaching toward these features of the present invention, and indeed, teaches away from such features.

Pudelski teaches the use of a low phosphorus or phosphorus-free lubricating oil composition used in combination with a solid film lubricant (see col 1, lines 10-20 of Pudleski). The reference notes that a problem with engines equipped with exhaust gas aftertreatment devices is that the same lubricating oil is used in both the crankcase and the valve train. According to Pudelski, as the valve train area of the engine is a high-wear area, the lubrication of such areas must include extreme pressure (EP) agents. These EP agents generally contain metals such as phosphorous. Some amount of these metals, when present in the oil used in the crankcase, eventually end up in the exhaust in the form of decomposition products of the EP agents, and so in the exhaust treatment device where they can cause damage to the device. (see col 1, lines 25-40 of Pudleski). Pudleski's solution to this problem is not the use of a low sulfated ash, phosphorus, and sulfur (low SAPS) oil in the engine overall, but rather the use of a solid lubricant film on the high wear areas of the engine and a low phosphorus oil composition in the low wear areas.

Pudelski makes it clear that the use of an oil composition that is low-phosphorus or phosphorus free is only possible due the presence of its solid film lubricant in the high wear areas of the engine. Without such a film, the low phosphorus (and so low EP agent) oils would not provide sufficient lubrication and protection to all parts of the engine (see col 1, line 65 to col 2, line 8 of Pudleski).

In contrast, the present invention provides a means of operating an engine using a low SAPS lubricating composition in combination with a fuel composition that contains a nitrogen-containing detergent additive. This method results in the improved performance of the engine by allowing for: increased service drain intervals, reduced emissions due to improved performance of exhaust gas treatment devices, improved deposit control, or combinations thereof. Pudleski, either alone or in combination with Forde, does not teach the use of such a combination in order to improve engine performance.

In fact, Pudleski is so focused on its teachings of a solid film lubricant, one skilled in the art would not combine the teachings of Pudleski with any other reference without incorporating the use of the solid film lubricant, which is taught as the essential element in Pudleski. Indeed, as Pudelski makes it clear that the use of a low phosphorus engine oil is only made possible through the use of its solid lubricant film on high wear engine parts, the reference clearly teaches away from the use of such low phosphorus lubricating compositions unless the solid film is also present.

Applicants' invention includes no such films yet still provides adequate protection to engines and in fact improves the performance of the engine in various areas. Pudelski provides no teaching or indication such a result is possible and in fact teaches away from attempting such a method.

Further, Applicants have amended claim 1 to make it clear that the methods of the present invention require that the engine is lubricated by a lubricating composition, and that this composition must include an oil of lubricating viscosity. This implicitly excludes the solid lubricant films of Pudelski as no other means of lubrication of the engine, such as solid films, are allowed for and the films of Pudelski consist of solid additives and not liquids such as oils of lubricating viscosity. While the solid films of Pudelski are deposited on engine parts using various means and compositions, an oil of lubricating viscosity, being a liquid at the operating conditions of an engine, cannot be a solid film lubricant as taught by Pudelski.

Therefore all rejections based on Pudelski should be removed. It is non-analogous art that is not a proper reference against the present invention. Furthermore, even if its teachings are combined with Forde, it does not teach the method of the present invention and in fact teaches away from such methods as it would always require the use of a solid film lubricant in high wear engine areas in combination with a low phosphorus oil composition. Applicants respectfully submit that the present claims are therefore both novel and non-obvious over Forde in combination with Pudelski and ask that these rejections be removed.

The Examiner also rejected claims 1, 3, 5 and 7-14 under 35 U.S.C. 103(a) as being unpatentable over Malfer et al (US 6,800,103) in combination Forde (US 6,136,051) and Pace et al (WO 02/18521 A2). Applicants respectfully disagree.

As noted above, Applicants have amended the claims to require that the engine of the claimed method is a spark-ignited or a compression-ignited engine having an exhaust treatment device and that the oil used in the engine have a phosphorus content below 0.1% by weight, a sulfur content below 0.5% by weight,

and a sulfated ash content below 1.5% by weight. Applicants submit that the combination of Malfer, Forde and Pace fail to teach such oil compositions as the teachings of Pace are limited to low phosphorus oils and provides no teachings of low ash and low sulfur oils. Forde and Malfer are directed to fuel compositions and provide no teaching on lubricating oil compositions.

In addition Applicants note that Pace teaches that low phosphorus oils, specifically oils with low levels of ZDDP, are more effective when they are used in combination with low sulfur gasoline. The use of low sulfur gasoline is what allows for the use of the low phosphorus oil compositions, according to the teachings of Pace (see page 2, lines 4 to 15 of Pace). In contrast, the present invention teaches that the use of a fuel composition, generally regardless of its sulfur content, which contains certain nitrogen-containing detergents, may be used in combination with a low SAPS oil composition and result in surprising improvements in the performance of the engine.

Pace provides no teaching of such additives, and one skilled in the art would have no motivation to combine the teachings of Pace with the teaching of Forde, at least not with any reasonable expectation that such a combination would allow for the use of fuels regardless of sulfur levels that still provide the benefits Pace connected to such sulfur limits.

As noted above, none of references cited provide any motivation or teaching toward combining the fuel detergent additives of the present invention with a low SAPS lubricating oil compositions. Even if there was such motivation, one skilled in the art would not expect the results demonstrated by the present invention. Pudelski teaches us that low phosphorus oils, including low SAPS oils, cannot be used without adding EP agents or using its solid lubricants films. Pace teaches us that low phosphorus oils, including low SAPS oils, cannot be used without ensuring low sulfur gasoline is also used in the engine.

In contrast the present invention provides a method of operating an engine using the combination of a low SAPS oil compositions and a fuel composition containing certain nitrogen-containing detergents, resulting in improved performance of the engine not expected or taught by any of the references cited, as demonstrated by the data included in the application.

Applicants also note that claim 3 is limited to diesel fuel. Forde, Pace and Malfer are limited in their teachings to gasoline. Therefore, Applicants respectfully

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submit that even if the Examiner finds the arguments above unpersuasive, claim 3 should be found to be both novel and non-obvious over the references.

Conclusion.

For the foregoing reasons it is submitted that the present claims are novel and unobvious over the cited references, and in condition for allowance. The foregoing remarks are believed to be a full and complete response to the outstanding office action. Therefore an early and favorable reconsideration is respectfully requested. If the Examiner believes that only minor issues remain to be resolved, a telephone call to the Undersigned is suggested.

Any required fees or any deficiency or overpayment in fees should be charged or credited to deposit account 12-2275 (The Lubrizol Corporation).

Respectfully submitted,

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